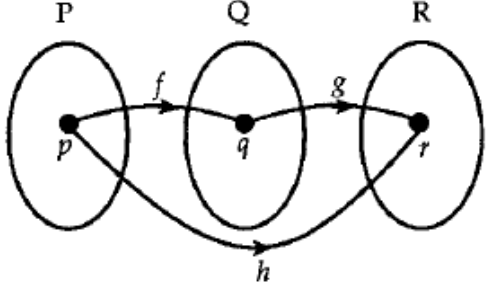


## Composite and Inverse Functions

2000 P2	<p><b>A3.</b> <math>f(x) = 3 - x</math> and <math>g(x) = \frac{3}{x}</math>, <math>x \neq 0</math>.</p> <p>(a) Find <math>p(x)</math> where <math>p(x) = f(g(x))</math>. <span style="float: right;">2</span></p> <p>(b) If <math>q(x) = \frac{3}{3-x}</math>, <math>x \neq 3</math>, find <math>p(q(x))</math> in its simplest form. <span style="float: right;">3</span></p> <p>(c) What is the connection between <math>p(x)</math> and <math>q(x)</math>? <span style="float: right;">1</span></p>
2. (JAN) 02 P1	<p>The function <math>f</math>, defined on a suitable domain, is given by <math>f(x) = \frac{3}{x+1}</math>.</p> <p>(a) Find an expression for <math>h(x)</math> where <math>h(x) = f(f(x))</math>, giving your answer as a fraction in its simplest form. <span style="float: right;">3</span></p> <p>(b) Describe any restriction on the domain of <math>h</math>. <span style="float: right;">1</span></p>
2003 P1	<p><b>9.</b> Functions <math>f(x) = \frac{1}{x-4}</math> and <math>g(x) = 2x + 3</math> are defined on suitable domains.</p> <p>(a) Find an expression for <math>h(x)</math> where <math>h(x) = f(g(x))</math>. <span style="float: right;">2</span></p> <p>(b) Write down any restriction on the domain of <math>h</math>. <span style="float: right;">1</span></p>
2005 P1	<p><b>4.</b> Functions <math>f(x) = 3x - 1</math> and <math>g(x) = x^2 + 7</math> are defined on the set of real numbers.</p> <p>(a) Find <math>h(x)</math> where <math>h(x) = g(f(x))</math>. <span style="float: right;">2</span></p> <p>(b) (i) Write down the coordinates of the minimum turning point of <math>y = h(x)</math>. <span style="float: right;">2</span></p> <p>(ii) Hence state the range of the function <math>h</math>. <span style="float: right;">2</span></p>
2006 P1	<p><b>3.</b> Two functions <math>f</math> and <math>g</math> are defined by <math>f(x) = 2x + 3</math> and <math>g(x) = 2x - 3</math>, where <math>x</math> is a real number.</p> <p>(a) Find expressions for:</p> <p>(i) <math>f(g(x))</math>; <span style="float: right;">3</span></p> <p>(ii) <math>g(f(x))</math>. <span style="float: right;">3</span></p> <p>(b) Determine the least possible value of the product <math>f(g(x)) \times g(f(x))</math>. <span style="float: right;">2</span></p>
2007 P1	<p><b>3.</b> Functions <math>f</math> and <math>g</math>, defined on suitable domains, are given by <math>f(x) = x^2 + 1</math> and <math>g(x) = 1 - 2x</math>.</p> <p>Find:</p> <p>(a) <math>g(f(x))</math>; <span style="float: right;">2</span></p> <p>(b) <math>g(g(x))</math>. <span style="float: right;">2</span></p>
2015 EP P1	<p><b>11.</b> Functions <math>f</math> and <math>g</math> are defined on suitable domains by <math>f(x) = x^3 - 1</math> and <math>g(x) = 3x + 1</math>.</p> <p>(a) Find an expression for <math>k(x)</math>, where <math>k(x) = g(f(x))</math>. <span style="float: right;">2</span></p> <p>(b) If <math>h(k(x)) = x</math>, find an expression for <math>h(x)</math>. <span style="float: right;">3</span></p>
2015 P1	<p><b>5.</b> A function <math>g</math> is defined on <math>\mathbb{R}</math>, the set of real numbers, by <math>g(x) = 6 - 2x</math>.</p> <p>(a) Determine an expression for <math>g^{-1}(x)</math>. <span style="float: right;">2</span></p> <p>(b) Write down an expression for <math>g(g^{-1}(x))</math>. <span style="float: right;">1</span></p>

2016 P1	<p>6. Functions <math>f</math> and <math>g</math> are defined on <math>\mathbb{R}</math>, the set of real numbers.</p> <p>The inverse functions <math>f^{-1}</math> and <math>g^{-1}</math> both exist.</p> <p>(a) Given <math>f(x) = 3x + 5</math>, find <math>f^{-1}(x)</math>. <span style="float: right;">3</span></p> <p>(b) If <math>g(2) = 7</math>, write down the value of <math>g^{-1}(7)</math>. <span style="float: right;">1</span></p>
2017 P1	<p>1. Functions <math>f</math> and <math>g</math> are defined on suitable domains by <math>f(x) = 5x</math> and <math>g(x) = 2\cos x</math>.</p> <p>(a) Evaluate <math>f(g(0))</math>. <span style="float: right;">1</span></p> <p>(b) Find an expression for <math>g(f(x))</math>. <span style="float: right;">2</span></p>
2017 P1	<p>6. A function, <math>h</math>, is defined by <math>h(x) = x^3 + 7</math>, where <math>x \in \mathbb{R}</math>.</p> <p>Determine an expression for <math>h^{-1}(x)</math>. <span style="float: right;">3</span></p>

### Pre 2000 Questions - Composite Functions

1	<p>The diagram illustrates three functions <math>f</math>, <math>g</math> and <math>h</math>. The functions are defined by <math>f(x) = 2x + 5</math> and <math>g(x) = x^2 - 3</math>.</p> <p>The function <math>h</math> is such that whenever <math>f(p) = q</math> and <math>g(q) = r</math> then <math>h(p) = r</math>.</p> <p>(a) If <math>q = 7</math>, find the values of <math>p</math> and <math>r</math>.</p> <p>(b) Find a formula for <math>h(x)</math>, in terms of <math>x</math>.</p> <div style="text-align: right;">  </div>	2, 2
2	<p>A function <math>f</math> is defined on the set of real numbers by <math>f(x) = \frac{x}{1-x}</math>, (<math>x \neq 1</math>).</p> <p>Find, in its simplest form, an expression for <math>f(f(x))</math>.</p>	3
3	<p>Functions <math>f</math> and <math>g</math>, defined on suitable domains, are given by <math>f(x) = x^2 + 1</math> and <math>g(x) = 1 - 2x</math>.</p> <p>Find:</p> <p>(a) <math>g(f(x))</math>; <span style="float: right;">2</span></p> <p>(b) <math>g(g(x))</math>. <span style="float: right;">2</span></p>	
4	<p>Functions <math>f</math> and <math>g</math>, defined on suitable domains, are given by <math>f(x) = 2x</math> and <math>g(x) = \sin x + \cos x</math>.</p> <p>Find <math>f(g(x))</math> and <math>g(f(x))</math>.</p>	4
5	<p>The functions <math>f</math> and <math>g</math> are defined on a suitable domain by <math>f(x) = x^2 - 1</math> and <math>g(x) = x^2 + 2</math>.</p> <p>(a) Find an expression for <math>f(g(x))</math>.</p> <p>(b) Factorise <math>f(g(x))</math>.</p>	2, 2

6	<p>(a) <math>f(x) = 4x^2 - 3x + 5</math>.</p> <p>Show that <math>f(x + 1)</math> simplifies to <math>4x^2 + 5x + 6</math> and find a similar expression for <math>f(x - 1)</math>.</p> <p>Hence show that <math>\frac{f(x+1) - f(x-1)}{2}</math> simplifies to <math>8x - 3</math>. (5)</p> <p>(b) <math>g(x) = 2x^2 + 7x - 8</math>.</p> <p>Find a similar expression for <math>\frac{g(x+1) - g(x-1)}{2}</math>. (4)</p> <p>(c) By examining your answers for (a) and (b), <b>write down</b> the simplified expression for <math>\frac{h(x+1) - h(x-1)}{2}</math>, where <math>h(x) = 3x^2 + 5x - 1</math>. (2)</p>
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#### Pre 2000 Questions - Domains

1	<p>The functions <math>f</math> and <math>g</math>, defined on suitable domains, are given by <math>f(x) = \frac{1}{x^2 - 4}</math> and <math>g(x) = 2x + 1</math>.</p> <p>(a) Find an expression for <math>h(x)</math> where <math>h(x) = g(f(x))</math>. Give your answer as a single fraction.</p> <p>(b) State a suitable domain for <math>h</math>. 3,1</p>
2	<p>Functions <math>f</math> and <math>g</math> are defined by <math>f(x) = 2x + 3</math> where <math>x \in \mathbf{R}</math> and <math>g(x) = \frac{x^2 + 25}{x^2 - 25}</math> where <math>x \in \mathbf{R}, x \neq 5</math>.</p> <p>The function <math>h</math> is given by the formula <math>h(x) = g(f(x))</math>.</p> <p>For which real values of <math>x</math> is the function <math>h</math> <b>undefined</b>? 4</p>

#### Pre 2000 Questions - Inverse Functions

1	<p>On a suitable set of real numbers, functions <math>f</math> and <math>g</math> are defined by</p> <p><math>f(x) = \frac{1}{x+2}</math> and <math>g(x) = \frac{1}{x} - 2</math>.</p> <p>Find <math>f(g(x))</math> in its simplest form. 3</p> <p>What is the connection between <math>f(x)</math> and <math>g(x)</math>? 1</p>
2	<p><math>f(x) = 2x - 1</math>, <math>g(x) = 3 - 2x</math> and <math>h(x) = \frac{1}{4}(5 - x)</math>.</p> <p>(a) Find a formula for <math>k(x)</math> where <math>k(x) = f(g(x))</math>.</p> <p>(b) Find a formula for <math>h(k(x))</math>.</p> <p>(c) What is the connection between the functions <math>h</math> and <math>k</math>? 2, 2, 1</p>